

and to a lever on the governor rocking arm at the other, with a hand wheel for regulating its pull, is always provided, and is of such a strength that it gives a total variation of 10 per cent in the engine speed, that is, 5 per cent above and below the normal.

There have been many types of throttle valve, but that introduced by Messrs. Belliss & Morcom in the early days of their engine has practically superseded all others on account of its simplicity. As will be seen from, fig. 42, it consists of a casing in which is suspended the double valve seat\*. The valve itself has no definite closing seat, and is perfectly balanced. The seat and valve are made of gun-metal in the smaller sizes, but cast iron may be used for the larger sizes.

The spindle is attached by a nut and collar to the valve, and passes through a long sleeve in the cover, the sleeve being usually made of gun-metal. As the valve requires little force to move it, the spindle may be of quite small diameter, and this is an advantage in helping to reduce the amount of leakage through the sleeve. A cup fixed on the rod from the governor receives the leakage, whence it may be drained by a small pipe to the high-pressure distance piece or other convenient place.

There is, of course, a force acting upon the end of the spindle equal to the area of the cross section multiplied by the steam pressure of the moment on the cylinder side of the valve, and this force should be taken into account when computing the strength of the springs. With this type of governor and throttle valve it is quite possible to obtain steady governing with 2 per cent variation between full load and no load, but this is too close for ordinary purposes, a variation of 5 per cent being usual.

When the two methods of governing are compared with respect to their effects upon the total steam consumption, for the range considered, it is found that the result depends to a certain extent on the load. There are two loads for which "throttle" governing and "cut-off" governing give identical results. For loads between those two, the consumption is in favour of cut-off governing, but at lower and higher loads "throttle" governing is\*

governing has a decided advantage.

If it happens that the normal full load of the engine is not far from the load corresponding to one of the neutral points just mentioned, and if the nature of the duty is such that the engine will be running at nearly that load for most of the time, then, obviously, no advantage is given by the additional complication of cut-off governing; but if the load on the engine fluctuates considerably below full load, then there will be an advantage in its adoption.

On the other hand, if the engine is likely to run at light loads for any considerable portion of the time, then throttle governing would give some advantage.

It is a mistake to have the throttle valve too big. The governing is then done through a smaller range of movement, • and therefore of speed, and hunting at light loads is likely to occur.

The cut-off gear is also useful for obtaining occasional overloads, being